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## DRYING TECHNIQUES OF SOME SELECTED ORNAMENTAL FLOWERS-A REVIEWS

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Article DOI: <https://doi.org/10.36713/epra6775>

DOI No: 10.36713/epra6775

### ABSTRACT

*Drying of flowers is the method of maintenance of flowers or removing water and moisture. Dehydration is most important for getting dry flowers. There are Many different types of methods use for removing moisture contain from flowers are air drying, embedded (sand, borax, silica gel, and other materials) press drying, freeze drying, microwave oven drying, hot air oven drying, Glycerin drying, freeze drying. Chrysanthemum is one of the most widely cultivated garden flowers and ranks popularity. The Chrysanthemum flower has fully double flowers with flat petals and the central disc is generally absent. Many of the commonly grown marigolds are cultivars of African and French marigolds. Flower petals of African marigold are the best source of carotene for coloring foodstuffs. From the dried flowers varied manufacture are made and use like petal embedded handmade paper, press dried flower products, candle making, pot pourri, floral jewelry etc. This dried plants and flowers materials also used in industry. For chrysanthemum embedded drying is the best in which flower shape, size, structure, colour are maintained and for marigold microwave and air drying techniques are best in size, colour, shape, colour are maintained.*

**KEYWORDS:** *Drying Techniques, Chrysanthemum, marigold, embedded, microwave*



## I. INTRODUCTION

A. Drying of flowers is the method of maintenance of flowers or removing water and moisture. Dehydration is the most important for getting dry flowers. There are many different types of methods use for removing moisture contain from flowers are air drying, oven drying, embedded drying (sand, borax, silica gel and other materials) microwave oven drying, freeze drying, press drying.

### B. Drying methods

1) *Air drying*: This one of the simplest and cheap method of drying techniques. It is conceived as the oldest and uncomplicated method for drying flowers. The simple and easiest and most effective way to dry. Flowers are tied in twine, ribbon and hang them warm air in the dark room this process take 1-2 week for complete dry and its depends upon atmospheric humidity, temperature, moisture, shape of flowers and air velocity. (Datta, S.K.,2015).

2) *Sun drying*: Sun drying is requiring a good deal of care in this method the plant equipment is embedded in the sand for drying. This medium is filled in container and reveal regular to the sun for expeditious dehydration. India is followed this method for drying many flowers. In the sand the flowers are embedded in flipped from and put in the sun light for drying for day or two (Murugan. A *et al.*,2007)

3) *Press drying*: Press drying is one of the most common and simple method for drying flowers. This method is still considered to be the most simplified or familiar method for preserving flowers and foliage. In this flowers shape cannot be maintained. Buy original colour is retained. For drying it take up to 3-4 weeks because it depends on the moisture content of tissues in flowers. (Datta S.K *et al.*, 2015)

4) *Hot air drying*: for expeditious dry in convention chamber, it has fan inside. For quick dehydration. In this method temperature should maintain between 30<sup>0</sup> to 35<sup>0</sup> C. hot air drying method take few hours to few days for completely to dry flowers. This method is advantage as atmosphere does not have any role for dehydration. This process is quick and the quality of the product is very good. (Raval *et al.*,2020)

5) *microwave drying*: this method takes only a 5-10 minutes in microwave. Flowers embedded in sand. After this process flowers are taken out

from microwave and put in room temperature for some time because flower materials completely dried. The embedded flower materials were dehydrated in microwave oven. Microwave oven dried flowers looks fresher and more attractive and colorful than that obtained by different methods. (P. Radha rani *et al.*,2015)

6) *embedded drying*: embedding is the one of the most vital processes for removing moisture contain in this method. Retention flowers petals and color is good. Silica gel, borax, corn Meal, sand disused for at the base of flower either before or after drying. In this method use containers like desk, trays, earthen pots etc. container size depends upon the size of flowers to be embedded. In this method moisture content in the flower is perfectly absorbed by around material. Sand or silica gel is poured without any hurring, carefully and gently so that flowers filled up 2.5cm from bottom. Silica gel is the perfect desiccant. Drying process is complete when flowers are crumble and dry to touch, but not brittle. For removing water contain from flowers, silica gel (60-20 mesh) is the perfect absorptive. (Jain. R *et al.*,2016)

## II. SELECTED FLOWERS

### A. Marigold

Marigold (*Tagetes erecta L.*), belongs to the family asteraceae. Marigold commercially cultivated in many countries for ornamental, medicinally and industrial's uses. African marigold is one the vital for business flower crops. Marigold native is central and south America, especially Mexico. Marigold is clearly organizing in two groups., African marigold and French marigold (*Tagetes Patula L*) In Karnataka, Andhra Pradesh and Maharashtra have big areas under contract cultivation of marigold. Most of quintessence units are located in Kerala and Andhra Pradesh. The African marigold (*Tagetes erecta*) have big, reduplicate, yellow to orange flowers from mid-summer to frost. Flower probability measure up to 12.7 cm across. Marigold maximum high varies from 24.5 to 90cms. African marigold are super bedding plants. African marigold is also adverted to as American marigolds (Manik h *et al.*,2015), (Misra *et al.*,2016) Duration of flowering the genetic control of the nature and changes in their rate suitable to environmental wayer it could be the possible case of review venation. (Panwar *et*



*al.*, 2013) reported that in African marigold common high grade for duration of flowering.

### **B. Chrysanthemum**

Chrysanthemum is belonging to the asteraceae family. Chrysanthemum is one of the nearly all over widely cultivated garden flowers and line in likely next to the rose is approval. Chrysanthemum can be arranged in classes inside many groups due to shape, size and colour of the flowers. The primary groups are under:

- a) *Incurved*: The ray flowers turn upwards and inwards at the middle of the blossom to form a globe-shaped.
- b) *Incurving*: Ray inflect loosely and asymmetrical and do not form a ball as upon.
- c) *Reflexed*: The flowers are plunging in one or not another that five rows with a primary central disc.
- d) *Pompon*: flowers are very tiny sized disc is absent or covert.
- e) *Rayonnaetes*: the petals are quilled. (Misra *et al.*, 2016)

Research in dry flowers in India is limited and published information on dry flowers techniques is approximately nominal. According to Bull *et al.*, 1999 chrysanthemum, marigold, roses are the best suited to hot air drying and microwave drying. Silica gel is ideal drying agent Prasad *et al.*, 1997. Singh and Dhaduk, 2005 observed that drying process at high temperature, oven showed fast result better than river sand and borax. Arvinda and Jayanthi., 2004 Standardized the drying technique methods like oven drying, sun drying, microwave drying for chrysanthemum (button local type) flowers and constitute that microwave drying with silica gel gave the perfect result for retaining colour, petals or shape of flowers. While in oven drying techniques white sand was found the perfect overall acceptability. Bhalla *et al.*, 2006 studied that most carotene and most least size reduction obtained when flowers were embedded in silica gel and dry on 3<sup>0</sup> C for 24 h in hot air oven and microwave oven for 35 seconds for drying. According to Champoux *et al.*, 1999 flower hung in dark room that took maximum 8 to 9 days for drying. According to Paul and shyalla 2002. the platform harvesting for other flower varies according the species and flower desired. According to Bhutani 1990 if sheets are kept in oven at an appropriate temperature that drying time can be less. Smith *et al.*, 1993 reported that

flowers like globe amaranth, chrysanthemum, and many different type of flowers unbroken and long lasting can be picked up for air drying techniques partially opened; as they flower proceed to open duration drying and some different are picked when they are perfectly mature. (P Radha rani *et al.*, 2015) studied that the numeral of time taken to drying the flower is more in river sand drying method i.e. 2 weeks, whereas chrysanthemum, daisy and gladioli has taken minimum amount of time approximately 8 days. Chrysanthemum, carnation etc. suitable for sun drying methods.

According to Datta *et al.*, 1997, The drying method can be quacked by placing the herbarium press under a hot air oven at 45-50<sup>0</sup> C for 24 hours. Embedded drying is admitting to undo petals becoming smaller in size and preserving the good flowers petals, shape, and colour condition. Datta 1997 reported that the Blotting papers, as well flowers are required to turn on as an alternative dry as storage of water contain and cellulose leads to microbial attack. For the most part, this method took 1-3 week but, time can be reducing by keeping on the oven at the proper temperature. Jain *et al.*, 2016 reported that the high temperature may exact the process but damages the flower pigments. It is too reported that the condition of flowers uncovers under 45<sup>0</sup>C temperature then flowers like chrysanthemum, gerbera, helipterum is dried within 48 hours where French marigold and African marigold are taken 72 hours and 96 hours respectively for perfect flower drying. According to Rengasamy *et al.*, 1999 observed that the sun drying is rapid process of dehydration and it is handy and depended on atmosphere. Sujata *et al.*, 2002 noted that flowers like chrysanthemum and zinnia dried good with minimum shrinkage when dried under sun. Bhutani *et al.*, 1990 recommended during study embedding method including with oven drying at 45<sup>0</sup> C to 50<sup>0</sup> C degree about 45 hours for drying of heliichrsum, chrysanthemum, acroclinum. According to Joykumar *et al.*, 1997 that the hot air oven drying techniques at 50<sup>0</sup> C cook beady time for drying aster (36 hours) and chrysanthemum (22 hours) flowers. Rengasamy *et al.*, 1999 reported that Tagets patula took 72 hours in oven at 40-44<sup>0</sup> C for drying. Kumar and parmar suggested that the flowers were dried at 45-49<sup>0</sup> C for 24-28 hours in oven drying and



then accord to quieten in open for a few hours and then taken out and used. According to Dahiya *et al.*,2003 get the best quality dried flowers having lowest water contain weight and high visual score at 50<sup>0</sup> C for 48 hours in the oven drying in chrysanthemum. Gouin *et al.*,1993 listed that some flowers like chrysanthemum, gladiolus and plasy are good for embedding in sand drying method. Bhalla *et al.*,2002 said that silica gel gave best result while river sand was not given result of overall admissibility of flowers. Moona *et al.*, 2004 found that minimum size change and maximum carotenoid content was received when flowers were embedded in silica gel. Arvinda and Jayanthi *et al.*,2004 studied that meanwhile different media silica gel as a medium noted maximum score of texture and shape in chrysanthemum. Datta *et al.*,1999 embedded flower with silica gel is suitable and put in room temperature for perfectly drying.

According to Sansakri. A and Anand. M *et al.*,2014 microwave oven drying technique process is done instead of entering in liquid state. As a result, products get from this process are retain their original size, shape and colour. In embedded method 40 to 45<sup>0</sup> C degree temperature electrically operated hot air oven controlled it used for drying flowers. Jain and Singh *et al.*,2016 noted that the India is exports 70% of the total share of floriculture products. Dried flowers and plant materials is important. According to Bhutani *et al.*,1990, Bhalla and Sharma, decorative floral craft item for drying techniques like oven drying, sun drying, microwave drying, freeze drying, embedded drying, air drying it can be used.i.e. cards, wall hanging, floral design, calendars etc. According to Baskaran *et al.*,2009 studied on condition that store in dry from remain dried beautiful for long-lasting periods. Dried chrysanthemum flowers are remarkable requirement in the global trade. For that reason, remain in this view the formidable capacity of dried chrysanthemum flower the relevant studies were made to systematize the dehydration technology for chrysanthemum flowers (*Dandranthema grandiflorum Tzvelev*) A real contents of published works included research and reviews are attainable in embedding drying method and dehydration of perlite, powdery particles, borax, silica gel river sand and their compounds. Types

of a size. The main parts of dehydration plant ornamental and flowers leaves through embedding drying techniques Orduno and Baltazaret *et al.*,1995, Bhalla *et al.*, 2006, Bhattacharjee and De *et al.*, 2003. According to Gouin *et al.*,1994 reported that listed some flowers and leaves like chrysanthemum, gladiolus, butterfly weed, black Eye-Susan, anemone and pansy is good for shade drying. According to Joykumar 1997 shade drying needed longer time for drying, 66 to 90 hours reputedly in flowers like chrysanthemum and aster. Bhutani *et al.*, 1990 asserted that flowers and leaves could be embedded in white silver sand in plastic, earthen container or metallic gave a good result. Smith *et al.*,1993 suggested storage of dried flowers with river sand in a strong carton to save the flower petals from breaking petals. Datta *et al.*, 2001 reported that material which used for flowers and foliage and embedding drying should be good. It should not chemically act with flower parts. Fine sand has been found to be the good material for embedding because it is simply to handle, heavy and doesn't act with water vapor. Lourdusamy *et al.*,2001 reported that floral like small size marigold, chrysanthemum, pansies embedded in sand in an upside down fashion was dry in days. According to sujatha *et al.*,2001 flowers like zinnia and chrysanthemum dried good with minimum shrinkage after placing them in a box containing stand and it takes few days for perfect drying. Pertuit *et al.*, 2002 suggested that burying the flowers in a mixture of sand and borax (2:1) result in floral that are little bit stiff than those preserved with "hang and dry" method, but the partials tend to cling to some flowers. Sand have rough border may produce little holes in the flower petals. Similarly, sing and Dhaduk *et al.*, 2004 found that borax reason dim of colour and rough texture of petals. According to Datta *et al.*,1999 embedded flowers and foliage with silica gel in a right holder and kept in room temperature for perfect drying. Orduno and Baltazar *et al.*,1995 noted that river sand or sea sand in attachment of borax for drying gerbera and rose they have reported that the rose dry good in river sand which include high ratio of borax within 15-20 days' period, when sea sand and river sand with low ratio of borax for 10-15 day best for gerbera. According to Joyce *et al.*,1998 Glycerinisation is comparatively cheap



and less expensive, glycerin has a high water attracting capacity. Westland *et al.*, 1995 reported that preserving leaves and berries in glycerin and hot water solution brought leaves and berries put into almost long lasting category. Paul and shyalla *et al.*, 2002 studied that the in glycerin drying, feature of the product was best as moisture in flower was diverted by a mixture and glycerin. The use of glycerin in drying method is reported to be successful with almost all foliage. Semant *et al.*, 1993 observed that one stage of glycerin mixed with 2 parts of hot water was typical mixture for twigs of 26 plant species to comprise at room temperature. The equipment should in solution as late as full absorption has taken place. According to Prasad *et al.*, 1997 reported that the Glycerin serves as a best source for microorganisms, so a pinch of antibiotic is important to detain microbial growth in the dried specimens. Bhattacharjee and De *et al.*, 2003 reported that many cultivars of carnation florals were cryodried and resided naturalistic in looks after being placed in freeze dried (-20<sup>0</sup> C) for 7 days. White *et al.*, 2002 has noted that microwave oven drying floral were looked more colorful and fresh than obtained by other techniques. Chen *et al.*, 2000 had appraise the effect of different freezing time (2 -4 hours), vacuum drying temperature (27<sup>0</sup>C, 37<sup>0</sup>C, 47<sup>0</sup>C) and freezing temperature (-35<sup>0</sup>C) on water content, petals, stems and colour of roses. Sohn *et al.*, 2003 studied that the impact of freeze drying for 15 days on the texture and colour of roses hybrid (CVS Tineke, Saphir, Roulette, Golden Gate, Rote Rose). According to Datta *et al.*, 1999 had given the drying time for different flowers in hot air oven at temperature of 45<sup>0</sup> -50<sup>0</sup> C. he had also noted the name of flowers right for oven drying method.

### III. CONCLUSION

Based on literature survey, here we have concluded that for chrysanthemum flower, microwave drying techniques are the best in which shape, size, colour are maintained compared to other and for marigold flowers wave and air drying, microwave and hot air drying is best in colour, size, shape, texture, maintain. So we can dry flowers by using this types techniques and make so many products like dry flowers jewelry, pot, pourri, candle making, photo frames, pressed dried products, handmade paper. The

dehydration technology, standardizes by CSIR-NBRI, will help to industry for dry flowers in agrestic areas.

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